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Total Hip Intraoperative Femur Fracture: Does a Tapered Wedge Design with a Size Specific Medial Curvature Reduce the Incidence of Intraoperative Femur Fracture?

Nicholas D Colacchio MD, Claire E Robbins, PT, Mehran Aghazadeh, MD, Carl T Talmo, MD, James V Bono, MD
[New England Baptist Hospital, Department of Orthopaedics. Grand Rounds Presentation 2017]

Study objective: This study investigates intraoperative femur fracture (IFF) between a system featuring a standard uncemented tapered wedge femoral stem and a system using a size specific medial curvature uncemented femoral stem.

Introduction:

- Intraoperative femur fracture is a well-known complication in primary uncemented total hip arthroplasty (THA).
- Prior studies have shown a second-generation proximally coated cementless tapered wedge stem has demonstrated:
 - o significantly higher proximal and distal canal fit (82% vs 54%)¹
 - o better canal fill ratio in the middle (90.6% vs. 85.3%) and distal (88.1% vs. 78.6%) sections¹
 - o increased proximal engagement with reduced distal fixation²
 - o reduction in micromotion²
- Key design enhancements of the second-generation stem²:
 - 1) size-specific increasing radius of curvature of medial stem flare
 - 2) proportional incremental stem growth
 - 3) modest reduction in stem length (~15mm)
 - 4) distal lateral relief

Materials and methods:

- A single experienced surgeon's patient database was retrospectively queried for IFF occurring during primary uncemented THA using a standard tapered wedge femoral stem system or a size specific medial curvature stem system.

- All procedures were performed using soft tissue preserving anatomic capsule repair and posterior approach.
- The primary outcome measure was IFF.
- A two-sample t-test was performed to determine significant difference between the two stems with respect to IFF.
- Patient demographics, native femoral neck angle, and implant characteristics (size, offset) were also examined.

Results:

- 41 of 1,255 patients (3.27%) who received a standard tapered wedge femoral stem sustained an IFF.
- 5 of 823 patients (0.61%) who received a size specific medial curvature stem incurred an IFF.
- t-statistic was significant at 0.05 critical alpha level, $t(2078)=3.067$, $p=0.0037$.
- No other significant associations were found with patient demographics or implant characteristics.
- The native femoral neck angle of patients with IFF were: 7% (3/45) coxa vara ($<120^\circ$), 46.5% (21/45) normal ($120-135^\circ$), 46.5% coxa valga ($>135^\circ$) (21/45).

Conclusions:

- A size specific tapered wedge femoral stem system resulted in greater than five times lower incidence of IFF than a standard medial curvature femoral stem system used for primary uncemented THA.
- Native femoral neck angle did not appear to be a significant independent risk factor for IFF.
- Identifying risk factors for IFF is necessary to facilitate implant system enhancements and help maximize patient outcomes.

References:

1. Faizan A, et al, Development and Verification of a Cementless Novel Tapered Wedge Stem for Total Hip Arthroplasty, *J Arthroplasty* (2014), <http://dx.doi.org/10.1016/j.arth.2014.09.023>.
2. Issa K, et al, Radiographic Fit and Fill Analysis of a New Second-Generation Proximally Coated Cementless Stem Compared To Its Predicate Design, *J Arthroplasty* (2013), <http://dx.doi.org/10.1016/j.arth.2013.04.029>.

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